

Claims

What is claimed is:

1. An apparatus for removing particulates from a gas stream, comprising:
a filter through which gas may be caused to flow;
at least one first electrode for producing an atmospheric glow discharge located near to but spaced apart from the filter; and
at least one second counter electrode, the said electrodes being connected to an AC voltage source generating an AC voltage in a frequency within the range of about 1 kHz to about 200 kHz.
2. An apparatus in accordance with claim 1 wherein the or each first electrode is situated at a first end of the filter.
3. An apparatus in accordance with claim 1 wherein the or each counter electrode is spaced away from the or each first electrode and situated in a location which lies downstream in use from the or each first electrode.
4. An apparatus in accordance with claim 3 wherein the or each counter electrode is situated adjacent to and in electrical contact with a second downstream end of the filter.
5. An apparatus in accordance with claim 1 wherein at least one of the said first and second electrodes comprises a point electrode.

6. An apparatus in accordance with claim 1 wherein the or each first electrode comprises a plurality of discharge locations.

7. An apparatus in accordance with claim 1 wherein the or each counter electrode comprises a plurality of discharge locations.

8. An apparatus in accordance with claim 6 wherein at least one of the electrodes comprises at least one conducting plate any part of the surface of which may provide a discharge location.

9. An apparatus in accordance with claim 6 wherein at least one of the electrodes comprises a network-like electrode in the form of a perforated sheet or a wire mesh of conducting material.

10. An apparatus in accordance with claim 1 wherein one of said electrodes comprises a surface electrode in the form of a layer of conducting material impregnatedly bonded to or deposited on an end surface of the filter.

11. An apparatus in accordance with claim 1 wherein the voltage source generates an AC voltage in a frequency range of about 18kHz to about 30kHz.

12. An apparatus in accordance with claim 11 wherein the voltage supply generates an AC voltage in a frequency range about 20 kHz to about 25 kHz.

13. An apparatus in accordance with claim 1 wherein the voltage source provides an open circuit output voltage of between about 5 kV and about 25 kV.

14. An apparatus in accordance with claim 1 wherein the filter comprises a ceramic surface upon which particulates may be trapped.

15. An apparatus in accordance with claim 14 wherein the filter comprises a monolith comprising at least one tubular cell defined by a porous ceramic wall.

16. An apparatus in accordance with claim 15 wherein the filter comprises a monolith having a depth of less than about 100 mm.

17. An apparatus in accordance with claim 16 wherein the filter comprises a monolith having a depth in the range of about 10 mm to about 25mm.

18. An apparatus in accordance with claim 15 further including a gas flow tube-stack, comprising a plurality of tubular cells placed in axial alignment with but spaced apart from and upstream of a first end of the monolith.

19. An apparatus in accordance with claim 18 wherein an electrode comprises a surface electrode in the form of a layer of conducting material impregnatedly bonded to or deposited on a portion of the tube-stack.

20. A method of removal of particulates from a gas stream, comprising:

causing the gas to flow through a filter so that particulates are separated from the gas flow and trapped by the filter;

positioning at least one first electrode near to but spaced apart from the filter;
providing at least one counter electrode; and
applying an AC voltage at a frequency in the range of about 1 kHz to about 200 kHz between the electrodes to generate an atmospheric glow discharge from the first electrode.

21. A method in accordance with claim 20 wherein the or each first electrode is positioned at a first end of the filter, and the or each counter electrode is positioned to be spaced away from the or each first electrode and situated in a location which lies downstream of the or each first electrode.

22. A method in accordance with claim 21 wherein the or each counter electrode is mounted in electrical contact with a second downstream end of the filter.

23. A method in accordance with claim 20 wherein an AC voltage at a frequency in the range about 18 kHz to about 30kHz is supplied.

24. A method in accordance with claim 23 where an AC voltage in a frequency range of about 20 kHz to about 25 kHz is supplied.

25. A method in accordance with claim 20 wherein the AC voltage is an open circuit output voltage of between about 5 kV and about 25 kV.

26. An apparatus for removing particulates from a gas stream, comprising:
a filter through which gas may be caused to flow;

an electrode arrangement for producing atmospheric glow discharges;
at least one counter electrode; and
an AC voltage source generating an AC voltage connected to the electrode arrangement and the counter electrode.

27. An apparatus for removing particulates from a gas stream, comprising:
a filter through which gas may be caused to flow;
an electrode arrangement for producing atmospheric glow discharges;
at least one counter electrode;
an AC voltage source generating an AC voltage connected to the electrode arrangement and the counter electrode; and
means for electrically stabilizing the electrode arrangement.

28. An apparatus in accordance with claim 27 wherein said stabilizing means is positioned electrically between the AC voltage source and locations on the electrode arrangement at which the atmospheric glow discharges occur.

29. An apparatus in accordance with claim 27 wherein said stabilizing means includes a resistor.

30. An apparatus in accordance with claim 27 wherein the AC voltage source generates an AC voltage in a frequency within the range of about 1 kHz to about 200 kHz.

31. An apparatus for removing particulates from a gas stream, comprising:
a filter through which gas may be caused to flow;
an electrode arrangement for producing atmospheric glow discharges;
at least one counter electrode;
an AC voltage source generating an AC voltage connected to the electrode arrangement and the counter electrode; and
a stabilizing impedance positioned electrically between the AC voltage source and locations on the electrode arrangement at which the atmospheric glow discharges occur.

32. An apparatus in accordance with claim 31 wherein said stabilizing impedance includes a resistor.

33. An apparatus in accordance with claim 31 wherein said electrode arrangement comprises a plurality of discharge electrodes.

34. An apparatus in accordance with claim 33 wherein said stabilizing impedance includes an impedance element associated with each discharge electrode.

35. An apparatus in accordance with claim 34 where each impedance element includes a resistor.

36. An apparatus in accordance with claim 31 wherein the AC voltage source generates an AC voltage in a frequency within the range of about 1 kHz to about 200 kHz.